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A Study of the Genus *Xenomyrmex* (Hymenoptera, Formicidae)

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The present paper attempts to show why a number of views on the taxonomy of *Xenomyrmex,* previously expressed by W. M. Wheeler and the writer, are no longer tenable. In 1953 when the writer presented the description of *X. stolli nodosus* (Amer. Mus. Novitates, no. 1634, pp. 1–5) the opinion was expressed that a better acquaintance with the representatives of *Xenomyrmex* in eastern Mexico would lead to the synonymy of some of the described forms. This prediction has proved embarrassingly accurate, for one of the subspecies that this study has thrown into the synonymy is the writer's *nodosus.*

The genus *Xenomyrmex* is a vexing group on several counts. The tiny workers are so small that no accurate idea of their structure can be obtained without unusually high magnification. It seems probable that most of the numerous errors contained in Wheeler's 1931 monograph of *Xenomyrmex* (Rev. Ent., vol. 1, fasc. 2, pp. 129–139) are due to his failure to appreciate this fact. But this is not the only difficulty that has beset the genus. An equally serious stumbling block has been the fragmentary character of the material which has reached the hands of specialists.

For more than half a century after its establishment by Forel in 1884, the genus *Xenomyrmex* contained only three representatives: the generitype, *stolli,* Emery's *floridanus,* and Wheeler's *lucayanus.* The last two were customarily treated as subspecies of *stolli.* In 1931, largely as a result of collections made by Elizabeth Skwarra in the state of

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Veracruz, Mexico, Wheeler more than doubled the size of the genus, but it is seldom that a revision has been based on so few specimens. Very little of Skwarra's material was sent to Wheeler. The publication of her ecological studies in 1934 (Ökologische Studien über Ameisen und Ameisenpflanzen in Mexiko, Königsberg, Prussia, privately published, R. Leupold, pp. 1–153) has made it clear that she took substantial series of specimens from several nests. But most of these she retained, and Wheeler was thus forced to deal with the wholly inadequate material sent to him. The situation was aggravated by the equal scarcity of the previously described forms. Wheeler's 1931 study appears to have been based on a total of not more than 75 specimens. Out of this handful of material came five new subspecies, all assigned to *stolli.* Some of these were based on such obviously inconsequential characters that they could be synonymized without recourse to additional material. In 1950 (Bull. Mus. Comp. Zoöl., vol. 104, pp. 224–226) the writer proposed to treat the subspecies *rufescens* as a synonym of *floridanus,* and in 1953 (*loc. cit.*) the same proposal was made for the subspecies *cubanus* and *lucayanus.* It seemed clear that the very minor color variations which formed the principal basis for the recognition of these subspecies had little to do with their distribution. In short, there is a single population of *Xenomyrmex* in southern Florida, the Bahamas, and Cuba in which the coloration is variable. But the array of forms from eastern Mexico presented a more difficult problem which demanded a better knowledge of their distribution for solution. During 1952 and 1953 the writer took nine colonies of *Xenomyrmex* in eastern Mexico. Eight of these belonged to the form that Wheeler named *skwarrae,* the ninth to *stolli.* The total number of specimens taken was 698 but equally important was the distribution of the colonies, which extended from southern San Luis Potosi through Tamaulipas into central Nuevo Leon. It was clear that over a considerable area *stolli* and *skwarrae* are sympatric, and it was equally clear that they show no signs of intergradation in this common range. Everything indicated that *skwarrae* could not be considered as a race of *stolli.*

This, however, was only a part of the problem. It was necessary to fit the other described forms into the picture. The principal basis for this work was the type material of *Xenomyrmex* in the collection of the American Museum of Natural History. Types in the collections of the United States National Museum and the Museum of Comparative Zoölogy were also consulted. These types and other material brought the total of specimens examined to more than a thousand. These types

repeatedly showed that statements made about them in Wheeler's 1931 monograph are seriously in error.

Before the individual species of *Xenomyrmex* are discussed, it is advisable to consider several general features of the genus which have, in the past, been misunderstood. The first has to do with the petiole of the worker. The writer must count himself with those who have misinterpreted the structure of this part. The petiole of *Xenomyrmex* is usually described as non-pedunculate or non-petiolate, and it is customary to add that it lacks a distinct node. In a petiole with a well-developed anterior peduncle there is no difficulty in distinguishing between that part and the node, for not only is the diameter of the anterior peduncle distinctly less than that of the node, but the node is well behind the point at which the anterior peduncle is attached to the thorax. But if the anterior peduncle shortens, this brings the front face of the node closer and closer to the declivious face of the epinotum. A number of ant genera have petioles of this sort, among them *Myrmica,* in many of the species of which the anterior peduncle is so short that the front face of the node rises close behind the attachment of the anterior peduncle to the thorax. Yet such a petiole is not regarded as non-pedunculate; hence it follows that the brevity of the anterior peduncle causes no difficulty as long as an easily recognized node stands behind it. What has caused misunderstanding in the case of *Xenomyrmex* is not the absence of the anterior peduncle but the peculiar character of the node of the petiole. This rises almost vertically from the short anterior peduncle. Its flattened anterior face always has, at either side, a prominent anterior corner where it meets the upper face. The upper face may be almost flat, or it may be distinctly convex. In the latter case (as in the typical *stolli*) this convexity has every appearance of a low node, and the main reason why it has not been recognized as such appears to be that Forel, in his original description of *stolli,* referred to it not as a node but as a "rounded boss." Regardless of the differences that occur in the upper face of the node, there is always a short, thick, cylindrical posterior peduncle behind it. Despite contrary statements that have been made, this is the only part of the petiole which is cylindrical. It is certain that Wheeler never appreciated this situation, for both his figures and his various descriptions of the worker petiole in his 1931 monograph are consistently inaccurate.

The second general feature of *Xenomyrmex* that needs clarification is the matter of sculpture. With the possible exception of *panamanus,*

which is at present known from too few specimens to permit generalization, it can be stated that the remaining forms all show considerable variation in the amount of thoracic sculpture present. In 1953 the writer called attention to the difficulties involved in using thoracic sculpture as a separatory feature. At that time it was my belief that thoracic sculpture could be so employed, despite the difficulties that result from the angle of illumination. A better acquaintance with *Xenomyrmex* has shown the fallacy of this view, and it has further shown that in several cases the thoracic sculpture of the type specimens is not at all as Wheeler described it. The writer has never seen any workers of *Xenomyrmex* in which the sides of the epinotum and the mesopleurae are completely devoid of sculpture (as Wheeler mistakenly believed is the case in the typical *stolli*) nor any, except *panamanus,* in which these parts are wholly covered with sculpture and opaque (as Wheeler incorrectly stated is the case with *cubanus*). In the most heavily sculptured specimens there are always smooth, shining areas present on the sides of the epinotum, and in the most lightly sculptured ones there is always some sculpture on the mesopleurae. But between these limits there is a wide variability within a nest series, and this appears to be a random matter. At least it is not correlated with size differences, as are the features discussed below.

In any long nest series the worker caste of *Xenomyrmex* varies slightly in size. These size differences are so trivial that they cannot be handled by the over-all size measurements that Wheeler employed. But if head length is used as the basis for their recognition, some interesting correlations with other structural features can be secured. The measurement used by the writer in this study is the length of the head from the most anterior point on the clypeal border (the level of the ends of the two clypeal teeth) to the rearmost level on the posterior border of the head. Thus measured the head of the "large" worker averages 0.6 mm. in length and that of the "small" one 0.4 mm. In the "large" specimens the transverse postpetiole is distinctly wider than the petiole and ordinarily possesses a lateral angle at either side where the curving anterior face meets the straight side. The petiole is very obviously longer than wide when seen in full face from above. In the "small" specimens the postpetiole is much less transverse and only a little wider than the petiole. Its curved anterior face usually rounds into the sides without producing appreciable lateral angles. The petiole of such specimens is shorter when seen from above but it is still a little longer than broad. This is true of the types of *skwarrae,*

despite the fact that Wheeler described the petiole in this insect as being "as broad as long." It should also be clear that Wheeler's *castus* is nothing more than a "large" worker of *skwarrae*.

Finally, the general structure of the male of *Xenomyrmex* must be considered. The writer pointed out in 1950 that the male of *skwarrae* is not at all like the figure of that caste which Wheeler published in 1931. It was possible to improve the accuracy of this figure, which was done, but it was not possible to state that certain striking structural features, present in the androtype of *skwarrae,* would also be present in the living insect. The male of *Xenomyrmex* is an extraordinarily delicate ant, and the peculiar configuration of the thorax which the androtype of *skwarrae* shows might have been a distortion due to crushing or drying. It was, therefore, highly gratifying to find 27 males in one of the nests mentioned above. In order to prevent the possibility of damage, these males were handled by the wings only. Each of them possessed, while alive, a prominent transverse furrow across the scutum. On drying this furrow usually deepens, which in some instances is accompanied by a partial collapse of the thorax and, in extreme cases, a collapse of the head capsule as well. But it is now clear that the transverse furrow on the scutum is a natural feature of the *Xenomyrmex* male. In addition to the males of *skwarrae* just mentioned, the writer has been able to examine 17 males of *floridanus* and six of *stolli.* Each of these insects possessed a prominent, transverse, scutal furrow. If, as seems likely, the same scutal furrow is present in the male of *panamanus,* this feature could be cited as one of the generic characteristics of *Xenomyrmex.*

In this paper only four of the previously described forms are considered to be valid. *Xenomyrmex panamanus, stolli,* and *floridanus* are treated as species, and *skwarrae* is treated as a western subspecies of *floridanus.* In the key which follows one of the principal separatory characters depends on a statistical treatment of the material. The different size range which distinguishes individuals of colonies of *stolli* from those of *floridanus* and *skwarrae* is the most reliable single feature for their separation. There is no reason for rejecting this serviceable distinction because an occasional large worker of *floridanus* enters the size range of *stolli* or an occasional small one of *stolli* drops into the size range of *floridanus.* If this type of key discourages the attempt to identify single specimens, so much the better, for most of the previous difficulties that have marked *Xenomyrmex* can be attributed to work with wholly inadequate quanties of material.

KEY TO THE WORKERS OF *Xenomyrmex*

1. Clypeus with two prominent carinae; lateral cephalic striae extending to the occiput; entire thorax heavily sculptured and opaque...*panamanus*
   Clypeus without carinae; cephalic striae largely restricted to the area between the eye and the insertion of the mandible; thoracic sculpture mainly confined to the mesopleurae and the epinotum.....2
2. The majority of workers in a colony with a head length less than 0.5 mm.; clypeal rugules usually prominent; anteroventral tooth on the petiole ordinarily well developed, color piceous brown.....*stolli*
   The majority of workers in a colony with a head length less than 0.5 mm.; clypeal rugules usually obscure or absent; anteroventral tooth on the petiole poorly developed or absent; color not as above.....3
3. Color clear golden or lemon yellow thruout .....*floridanus skwarrae*
   Color dirty brownish yellow to golden yellow, the gaster always extensively infuscated .....*floridanus floridanus*

Xenomyrmex floridanus floridanus Emery

Xenomyrmex stolli subspecies *floridanus* EMERY, 1895, Zool. Jahrb., Syst. Abt., vol. 8, p. 275 (worker, male). WHEELER, 1931, Rev. Ent., vol. 1, fasc. 2, p. 135, figs. 2a, b, c (worker, queen, male).

Xenomyrmex stolli subspecies *lucayanus* WHEELER, 1905, Bull. Amer. Mus. Nat. Hist., vol. 21, p. 87 (worker). CREIGHTON, 1953, Amer. Mus. Novitates, no. 1634, p. 2, synonymic note.

Xenomyrmex stolli subspecies *rufescens* WHEELER, 1931, Rev. Ent., vol. 1, fasc. 2, p. 137 (queen). CREIGHTON, 1950, Bull. Mus. Comp. Zoöl., vol. 104, p. 226, synonymic note.

Xenomyrmex stolli subspecies *cubanus* WHEELER, 1931, Rev. Ent., vol. 1, fasc. 2, p. 134 (worker). CREIGHTON, 1953, Amer. Mus. Novitates, no. 1634, p. 2, synonymic note.

In the opinion of the writer this study clearly shows that *floridanus* and *skwarrae* are eastern and western races of a population that is specifically distinct from *stolli*. That this has not been appreciated sooner may be attributed to a number of mistaken ideas concerning *skwarrae* which Wheeler published in 1931. Wheeler believed that of all the subspecies that he assigned to *stolli, skwarrae* was the most clearly distinct. He supported this view with several statements which are without basis in fact. Wheeler's mistaken belief that *skwarrae* has a square petiole is discussed above, but this was not his only error in regard to this insect. Wheeler stated that the worker of *skwarrae* lacks erect hairs on the body. The writer has examined hundreds of workers of *skwarrae* and has yet to find one where prominent erect hairs are not present on the head, thorax, and gaster. Indeed the thoracic pilosity seems to be exceptionally constant. There are ordinarily from 10 to 12 erect hairs present, two on the epinotum, four on the mesonotum,

and a cluster of two or three at either side of the pronotum. Precisely this same hair pattern occurs in *floridanus floridanus* and a similar but more extensive one in *stolli*. As Wheeler described the erect body hairs in *stolli,* it is difficult to understand how he could have failed to note them in *skwarrae*. Another error marks Wheeler's attempt to distinguish between the female of *floridanus* and that of *skwarrae* on the basis of over-all size differences. Wheeler based this comparison on three females of each form. Those of *skwarrae* were said to be "decidedly smaller." In the comparison presented below the writer had nine females of the typical *floridanus* and 136 of *skwarrae*. All the former and 30 of the latter were measured, with head length as an indication of size. The head length of the nine females of *floridanus* averaged 0.77 mm., and none of these females departed from the average by more than 0.02 mm. The 30 females of *skwarrae,* which were picked at random from eight nests, showed an average head length of 0.763 mm., and, while one individual in the series departed from this average by 0.037 mm., none of the others were more than 0.025 mm. from it. In short, no significant size difference exists between the female of *floridanus floridanus* and that of *floridanus skwarrae*. In both, the head length varies from 0.75 mm. to 0.79 mm., with the average about 0.77 mm.

The only thing that clearly distinguishes these two races is color. As the writer has been at considerable pains to point out that the minor color variations that occur in the eastern population are without taxonomic significance, the above statement may seem paradoxical. But this very fact is what gives significance to the color difference, for the western *skwarrae* population is as constant in its coloration as the eastern *floridanus* population is variable. In the worker of *skwarrae* the color is a uniform, clear lemon yellow to golden yellow, without a trace of infuscation at the posterior edge of the gastric segments. In the female of *skwarrae,* which is also golden yellow, the gastric segments are infuscated with brown at their rear edges, and there is a large, brown basal spot at either side of the first gastric segment. There is also an infuscated, lateral band at either side of the scutum, but this is as far as the infuscation goes in the mature female of *skwarrae*. In *floridanus floridanus* both the female and the worker have an extensively infuscated gaster. As a general rule the entire gaster is a uniform, deep brown color, although an occasional specimen may have a yellow patch at the base of the first segment. This circumstance insures the fact that when the color of *floridanus floridanus* approaches that of *skwarrae,* as it certainly does in some of the more lightly colored series,

then the specimens will be very obviously bicolored because of the darker gaster. In most cases the coloration of fresh specimens of *floridanus floridanus* is a characteristic dirty, brownish yellow. In preserved specimens the color of the head and thorax fades, often very notably, but that of the gaster does not; hence there is little difficulty in recognizing specimens of the typical *floridanus* no matter how faded they are.

The localities for *floridanus floridanus* (including those formerly attributed to *rufescens, lucayanus,* and *cubanus*) are as follows: *Florida:* Lake Worth (type locality), T. Pergande, in *Sideroxylon mastichodendron;* Punta Gorda, T. Pergande; Lone Pine Key, W. M. Wheeler; Dunedin, W. S. Blatchley; Paradise Key, H. S. Barber; Key Largo, Manalapan and Miami, W. F. Buren; Archbold Biological Station, Lake Placid, T. C. Schneirla. *Bahamas:* Andros Island, Mangrove Key, W. M. Wheeler, W. M. Mann; Southern Bight, W. M. Wheeler, in *Tillandsia* sp. *Cuba:* Mina Carlotta, near Cumanayagua, W. S. Creighton.

Xenomyrmex floridanus skwarrae Wheeler

X. stolli subsp. *skwarrae* WHEELER, 1931, Rev. Ent., vol. 1, fasc. 2, p. 137, figs. 2d, e, f (worker, queen, male).

X. stolli subsp. *castus* WHEELER, 1931, *ibid.*, p. 138 (worker, queen). New synonymy.

Wheeler's description of the subspecies *castus* is clearly a result of the fact that he had so little material of either *castus* or *skwarrae* that he failed to recognize the slight size variations which occur in the worker caste of this insect. He also seems to have misunderstood the character of the femora in the female of *skwarrae* which he regarded as "more compressed" than those of *floridanus.* The structure of the middle and hind femora in the *Xenomyrmex* female (and to a lesser extent in the worker also) is peculiar. There is a groove on the ventral face of the femur into which the tibia can be folded. The inner wall of this groove is notably higher than the outer wall, but when the tibia is folded into the groove the inner wall is largely hidden. Under such circumstances the femur appears to be much less expanded (or "more compressed") than when the leg is fully extended. Thus Wheeler's distinction appears to be due to the fact that in his females of *skwarrae* the middle and hind legs were folded, while in those of *floridanus* these legs were extended. As far as the writer has been able to determine, there is no difference in the size of the femora in the females of the two races.

The records for *floridanus skwarrae* are presented below (where no collector's name follows the record, the collector was the writer): *Veracruz:* Camaron (type locality), E. Skwarra, in spines of *Acacia spadigera;* Mirador, 3000 feet, E. Skwarra, in *Tillandsia streptophylla. Tamaulipas:* Canyon de el Abra, 1000 feet, two colonies in hollow twigs. *San Luis Potosi:* Chupaderos, 1300 feet, two colonies, one in the hollow stem of a dead liana, the other in the dead limb of a strangling fig; El Salto, 1400 feet, one colony in a hollow twig; 3 miles north of Valles, 600 feet, nest-founding female; 10 miles east of Xilitla, 500 feet, two colonies in hollow twigs; Rio Amahac near Tamazunchale, 300 feet, one colony in dead twig.

In addition to the above records there is another record based on specimens intercepted at the Laredo Quarantine Station. This nest was in wood associated with orchids that had been shipped from Ciudad del Maiz, San Luis Potosi. For the evaluation of this record, see the discussion under *stolli.*

Xenomyrmex panamanus Wheeler

Myrmecinella panamanus WHEELER, 1922, Amer. Mus. Novitates, no. 46, p. 1, fig. 1 (worker).

Xenomyrmex panamanus WHEELER, 1931, Rev. Ent., vol. 1, fasc. 2, p. 133, figs. 1, 2 (worker).

Although this species was originally described from two workers and although the sexual forms are unknown, there is no reason to question Wheeler's final recognition of it as a representative of *Xenomyrmex* or his contention that *panamanus* is specifically distinct from *stolli.* Indeed it could be wished that the other species of *Xenomyrmex* were as clearly marked as *panamanus.* The head of the worker of *panamanus* is broader in proportion to its length and has much more convex sides than in the other species. The clypeal structure is also unique. The two prominent angles or teeth which flank the median lobe of the clypeus in *stolli* and *floridanus* are not present in *panamanus,* as the median lobe of the clypeus rounds into the flanking lateral portions through a blunted curve. Moreover, the median lobe of the clypeus in *panamanus* is marked by two prominent, parallel carinae which are not present in the other two species. The writer is not inclined to attach much significance to Wheeler's stress of the deep mesoepinotal impression or the prominent anterior angles of the petiole in *panamanus,* but there is little doubt that the cephalic and thoracic sculpture of *panamanus* (see key) is far more extensive than that of the other two species.

Nothing is known of the habits of *panamanus*. Wheeler, who appears to have been the only myrmecologist to see it alive, found the two type specimens and several others running on tree trunks at Colon, Mt. Hope, and Barro Colorado, Panama.

Xenomyrmex stolli Forel

Xenomyrmex stolli FOREL, 1894, Bull. Soc. Vaudoise Sci. Nat., ser. 2, vol. 20, p. 396 (worker). EMERY, *in* Wytsman, Genera insectorum, fasc. 174, p. 188 (worker). WHEELER, 1931, Rev. Ent., vol. 1, fasc. 2, p. 134 (worker).

Xenomyrmex stolli subspecies *mexicanus* WHEELER, 1931, *ibid.*, p. 134 (worker). New synonymy.

Xenomyrmex stolli subspecies *nodosus* CREIGHTON, 1953, Amer. Mus. Novitates, no. 1634, p. 3, fig. 1 (female, worker). New synonymy.

The writer is at a loss to account for the discrepancies in Wheeler's treatment of *stolli*. In the key that he published in 1931 Wheeler states that in the worker of *stolli stolli* the mesopleurae and the sides of the epinotum are smooth and shining. As the typical *stolli* was separated from *stolli mexicanum* mainly on a color difference, it would be assumed that this subspecies also lacks thoracic sculpture in the worker. The writer fell into this trap when the subspecies *nodosus* was described. Acutally there is no difference in the thoracic sculpture of the worker in *stolli stolli, stolli mexicanum,* and *stolli nodosus*. The amount of thoracic sculpture varies within a nest series and the matter is complicated by the fact that the angle of illumination plays an important part in bringing out the sculpture clearly. But even if improper illumination was employed, it is hard to see how Wheeler missed the obvious areas of sculpture that are present on the sides of the thorax in Forel's types of *stolli*. The writer has been able to examine five of these cotypes for, in addition to the four that Forel sent to Wheeler, there is another which he sent to Pergande in the United States National Museum collection. If the fading due to age is allowed for, there is no difference between these cotypes and those of *mexicanum* and *nodosus*. Not only is the sculpture the same but all have the same prominent, rounded elevation on the dorsal surface of the petiole which the writer mistakenly attributed to *nodosus* alone. The agreement is far too complete to permit the recognition of subspecies; hence *mexicanum* and *nodosus* have been treated as synonyms of *stolli*.

The records for *stolli,* including those previously attributed to *mexicanum* and *nodosus,* are as follows: *Guatemala:* Guatemala City (type locality), O. Stoll, in oak gall. *Mexico:* Veracruz, Mirador, near

Huatusco, 3000 feet, E. Skwarra, in *Tillandsia balbisiana;* Nuevo Leon, 20 miles north of Montemorelos, 1400 feet, W. S. Creighton, in *Quercus fusiformis.*

To these records may be added three others based on specimens intercepted at plant quarantine stations. The first of these needs little comment, as the source was San Jose in Guatemala. Specimens of *stolli* were taken on plants of *Lobelia superbens* shipped from San Jose. The other two records need a more careful consideration. Both these interceptions were made at the Laredo Station. One consisted of a large colony of *stolli* which was nesting in the pseudobulb of an orchid that had been shipped from Ciudad del Maiz in San Luis Potosi. Ciudad del Maiz lies at an elevation of about 4000 feet in the western foothills of the Sierra Madre Occidental. The valley in which the town is situated is decidedly arid and it is scarcely possible that orchids could grow there. But in the mountains about 13 miles east of Ciudad del Maiz there are areas where orchids grow in abundance on oak trees (*Quercus castanea* Nee). The natives are well aware of the presence of these orchids and collect and sell them. The probability is, therefore, that the actual source of the intercepted shipment was not Ciudad del Maiz but some station in the mountains east of Puerto de Lobos. The other intercepted shipment, also in an orchid pseudobulb, was marked only "San Luis Potosi." Probably the same explanation applies, for all that state west of the Sierras is far too dry for orchids.

A comparison of the above records with those given for *floridanus skwarrae* will show that in northeastern Mexico both these insects inhabit stations in or near the eastern Sierra. The writer is ready to admit that the two have been taken at the same station only once (Mirador, Veracruz), but there can be no reasonable doubt that their lateral range is the same or that their elevational ranges, which appear to differ, overlap. In view of the paucity of the material taken so far, it may be premature to attach significance to the lack of intergrades in this region, but certainly one would expect them to be present if subspecies were involved.

In conclusion the writer wishes to discuss the habits of *Xenomyrmex,* for these have been very imperfectly known. As far as can be determined the number of *Xenomyrmex* colonies taken to date totals 31. This excludes five instances in which only strays were taken. Of these 31 colonies, only two were living with other ants. In addition to the type colony of *stolli,* which was living in an oak gall with *Camponotus (Myrmobrachys) abcissus,* a second colony of this same species was taken by Skwarra from the basal bulb of *Tillandsia balbisiana* where

it was living with *Solenopsis* (*Diplorhoptrum*) *picta*. But there is no evidence that any of the remaining 29 colonies were sharing the nest of another ant, and in 21 cases it has been definitely stated that they were living alone. Hence, Wheeler was correct in holding that the name *Xenomyrmex* is a misnomer, for these little insects are not ordinarily guest ants.

It further seems clear that *Xenomyrmex* normally nests in plant tissues, either in preformed cavities or in passages that they excavate themselves. It is often impossible to be certain of the plant in which the nest was originally founded, for *Xenomyrmex* will nest in dead twigs or limbs that are rotten at the base. These subsequently fall from the tree into the crown of some lower plant, or to the ground, without disturbing the colony inside. Under such circumstances it is rarely possible to determine the species of the host plant, and this probably accounts for the comparatively small number of host plants which have been reported. These are as follows:

Acacia spadicigera thorns (*X. floridanus skwarrae*)
Ficus sp. (*X. floridanus skwarrae*)
Liana stem sp. (*X. floridanus skwarrae*)
Orchid pseudobulbs (*X. stolli, X. floridanus skwarrae*)
Quercus fusiformis (*X. stolli*)
Quercus sp. (*X. stolli*)
Rhizophora mangle (*X. floridanus floridanus*)
Sideroxylon mastichodendron (*X. floridanus floridanus*)
Tillandsia balbisiana (*X. stolli*)
Tillandsia streptophylla (*X. floridanus skwarrae*)
Tillandsia sp. (*X. floridanus floridanus*)

The above list shows that the members of this genus have little tendency to limit themselves to a particular kind of host plant. They will utilize preformed cavities in plant tissues or, if these are lacking, make their own. The captive colonies discussed below excavated so much wood from the twigs in which they were living that at times this "sawdust" interfered with the observation of the colonies.

The studies that follow are based on *X. floridanus skwarrae,* but there is little reason to suppose that the habits of the other members of the genus differ widely from those of *skwarrae*. Because of their small size these little ants cannot be successfully confined in an ordinary observation nest. The only practical method of handling the colonies was to keep them in large collecting vials which were plugged with cotton. After a colony was discovered, the twig that housed it was cut into lengths which would fit into the vial, and these sections were

split longitudinally. The pieces of twig were placed in the vial with the split sides upward, and after the mouth of the vial had been plugged with cotton it was glued to a card to prevent rolling. The only way in which water could be supplied to these colonies was to wet the outer end of the cotton plug. At first the writer feared that this would not keep the colonies moist enough. They had been secured on April 23 and 24 in Tamaulipas and eastern San Luis Potosi, but during most of the following six weeks we were in very arid areas in Chihuahua. In these areas it was so difficult to keep the cotton plugs moist that the attempt was soon given up, with the expectation that the colonies would die as a result. Instead they flourished for weeks with virtually no water and brought a large amount of brood to maturity. This ability to tolerate drought is remarkable on the part of an ant much of whose range lies in an area of cloud forests.

It soon became clear that the captive colonies would accept various sweet liquids as food. They seemed especially fond of the juice of canned peaches, but their fondness for this was notably less than their obvious liking for the tissues of termites. When termites were fed to them the *skwarrae* workers not only lapped up the body fluids of the termites but cut their tissues into small pieces which they thrust into the mouths of the larvae. This was followed by extensive chewing and salivation on the part of the larvae. As a rule the copious salivary secretion of the larva formed a bubbly mass above its jaws. When this happened the worker would often take away the piece of termite and give it to another larva. It seems probable that termites may be the main item of diet in the case of *Xenomyrmex,* and if so this would explain their preference for nests in dead wood, because such nests would bring them into frequent contact with termites. The worker pupa of *skwarrae* is fully colored for at least three days before the final molt; hence there is no callow period in the worker of this subspecies, but the males and females are not fully colored when they emerge. It appears that the workers may eat the pupal exuviae; at least none were seen in the captive nests, although many pupae transformed during the period of observation. Despite their small size the workers of *skwarrae* are capable of surprisingly rapid movement. The female is less agile, perhaps because she usually has several workers riding on her voluminous gaster as she moves about the nest. In most colonies only one female is present.

The marriage flight of *skwarrae* occurs in April and probably early May as well. On April 6 the writer discovered near Valles, San Luis Potosi, a single female who had begun to excavate a cell in a twig. She

had so recently completed her marriage flight that her wings were still present. In addition, nests containing both callow and mature alates were secured on April 24, but these nests contained only worker brood. As this was also true of nests taken as late as February, it appears that sexual brood is produced in March and matures in April or early May. This does not seem to be true of the typical *floridanus* or of *stolli*. In both cases winged sexual forms have been taken in the nests in June. There is, however, no positive indication as to when the marriage flight occurs in the latter two insects.